Improvements to OMPS-LP aerosol and ozone algorithms

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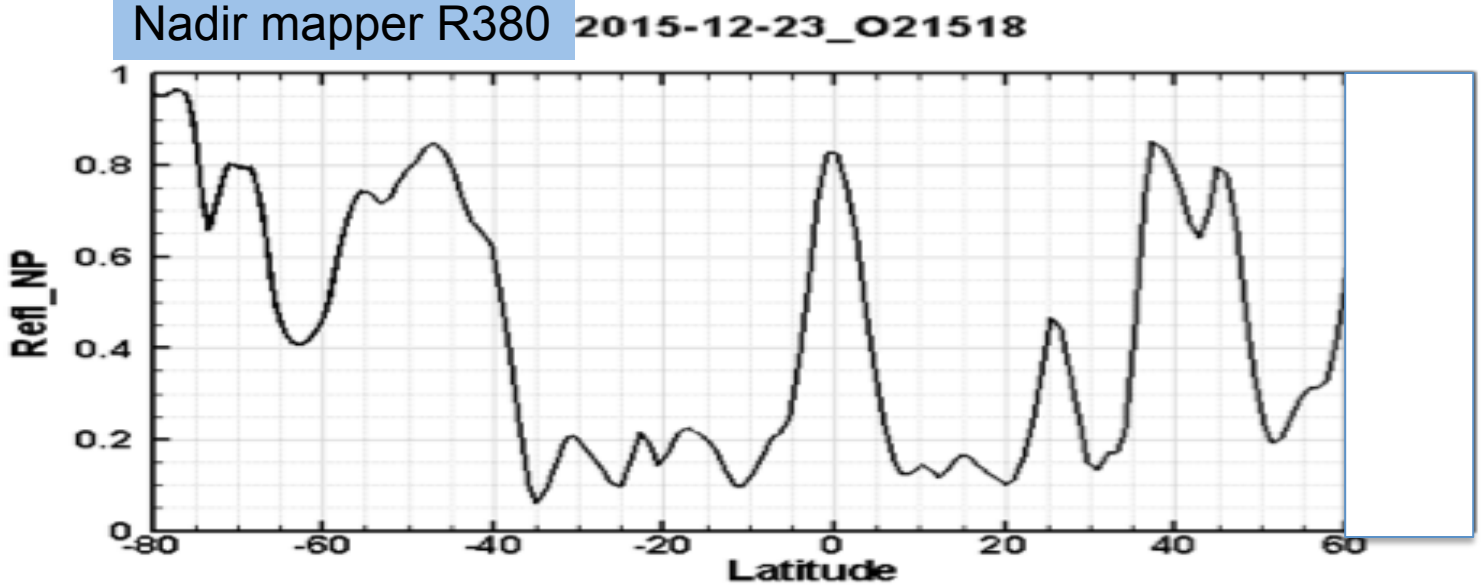
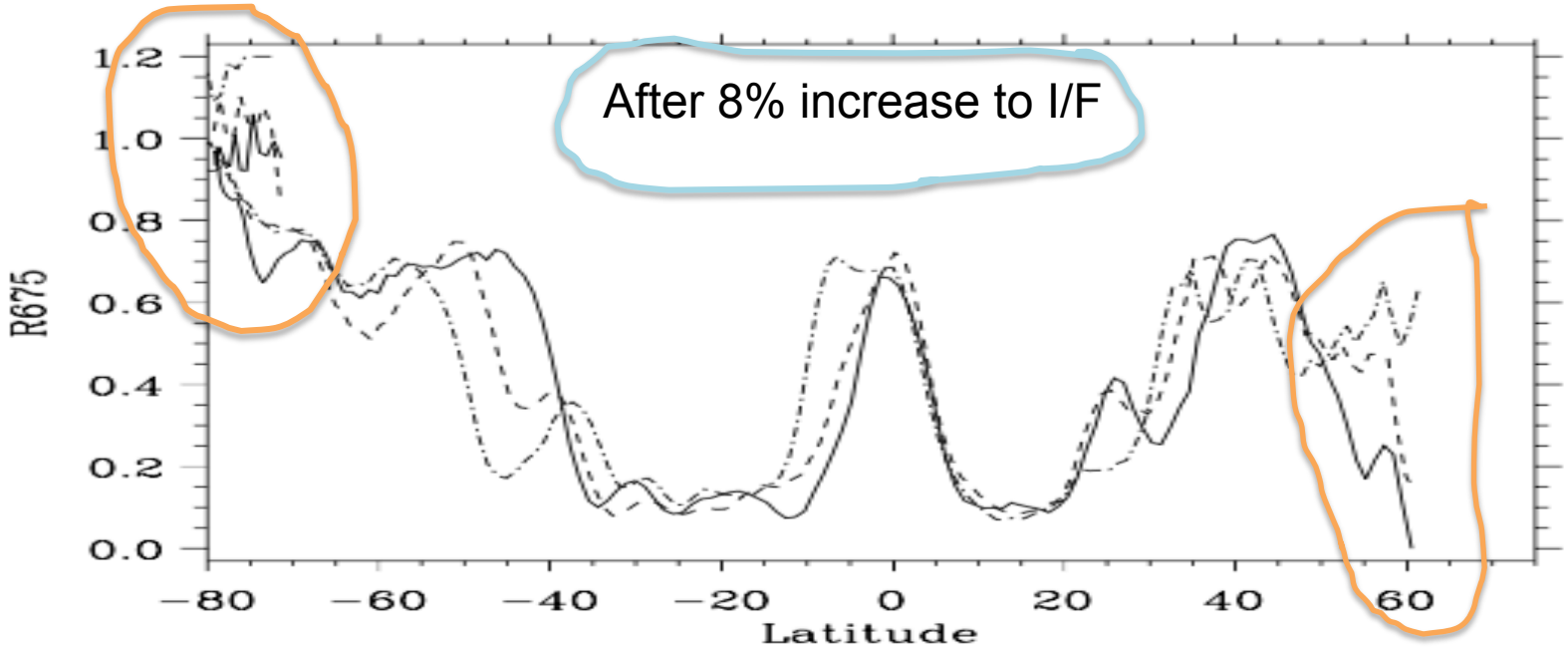
Planning ATBD review in fall/winter this year

Improvements to L1B

- Improved altitude registration
  - Assumes no variation in S/C attitude along the orbit.
  - Apparent ~500 m variation in TH altitude within the first 10 minutes after sunrise, which could either be due to S/C flexure or error in MERRA GPH.
- Improved stray light Correction
- Provides sun-normalized radiance (I/F)
  - Derived reflectivity indicates ~8% error in I/F.

Nadir mapper R380



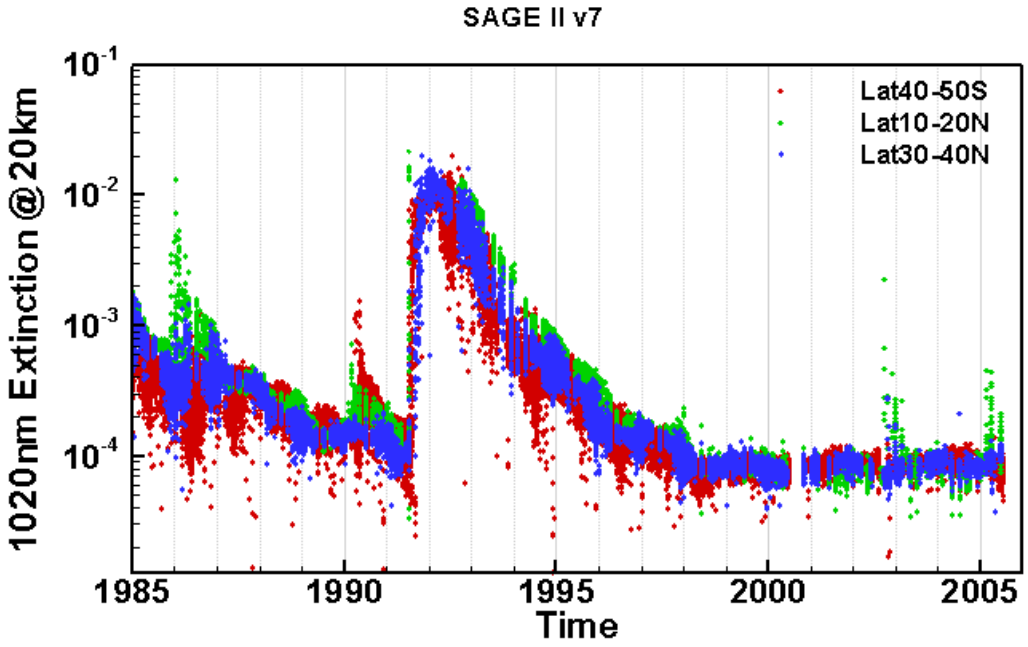


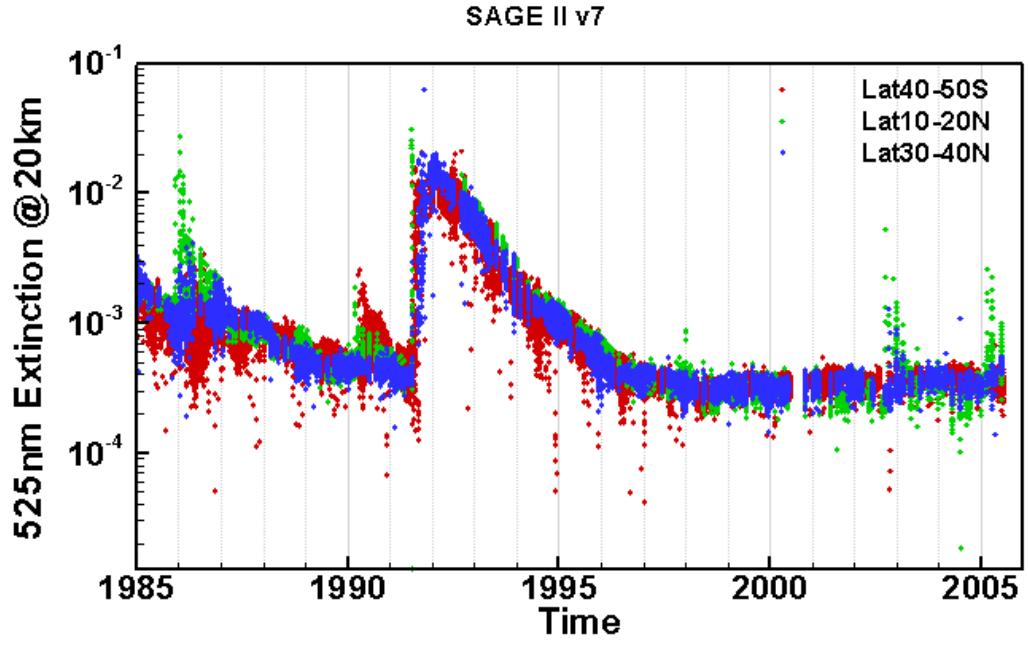
OMPS LP R675 derived from 40.5 km radiances

V1.0 Aerosol algorithm

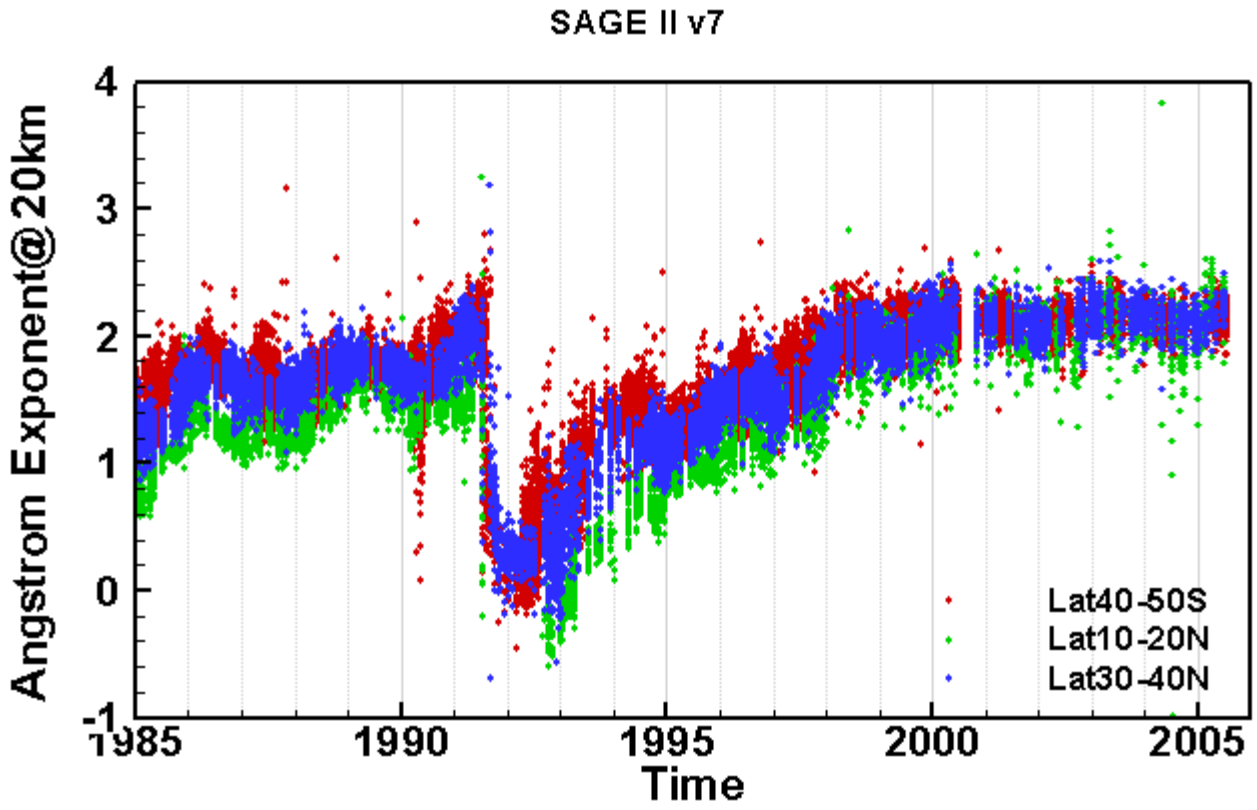
- Uses 675 nm Rayleigh-corrected radiances $(I-I_0)/I_0$
  - I_0 is calculated using MERRA data assuming no aerosols and 40.5 km reflectivity
- Bimodal lognormal size distribution
- Chahine's non-linear relaxation algorithm
  - Fixed at 3 iterations.
- Cuts-off at cloud-top altitude (Chen et al., AMT, 2016). When there are no clouds retrievals may be good down to 10-12 km.
- Provides residuals at 8 wavelengths for diagnostics and future improvements.

Extinctions @20km from SAGE v7 data

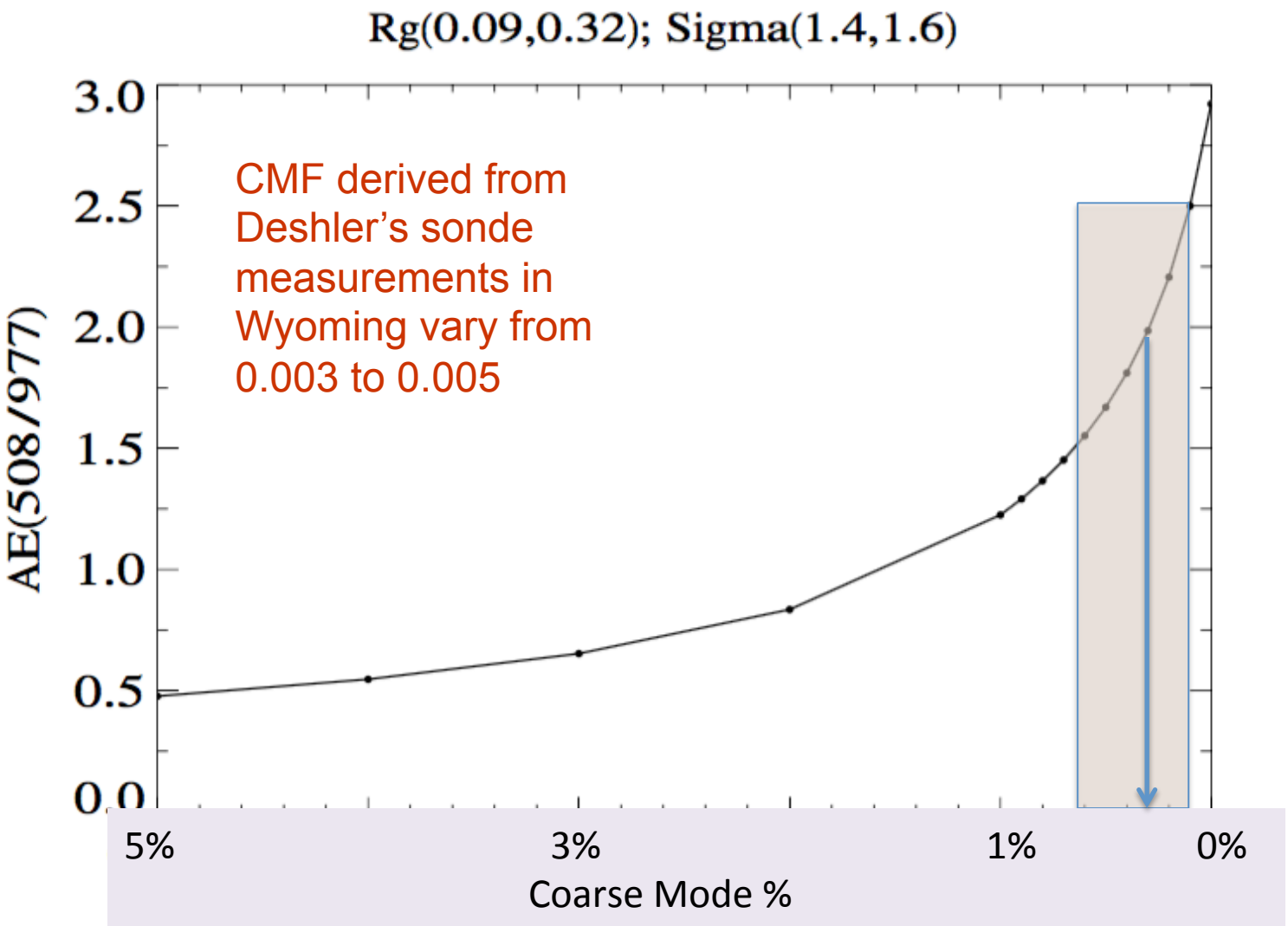




α(525/1020) @20km from SAGE v7 data

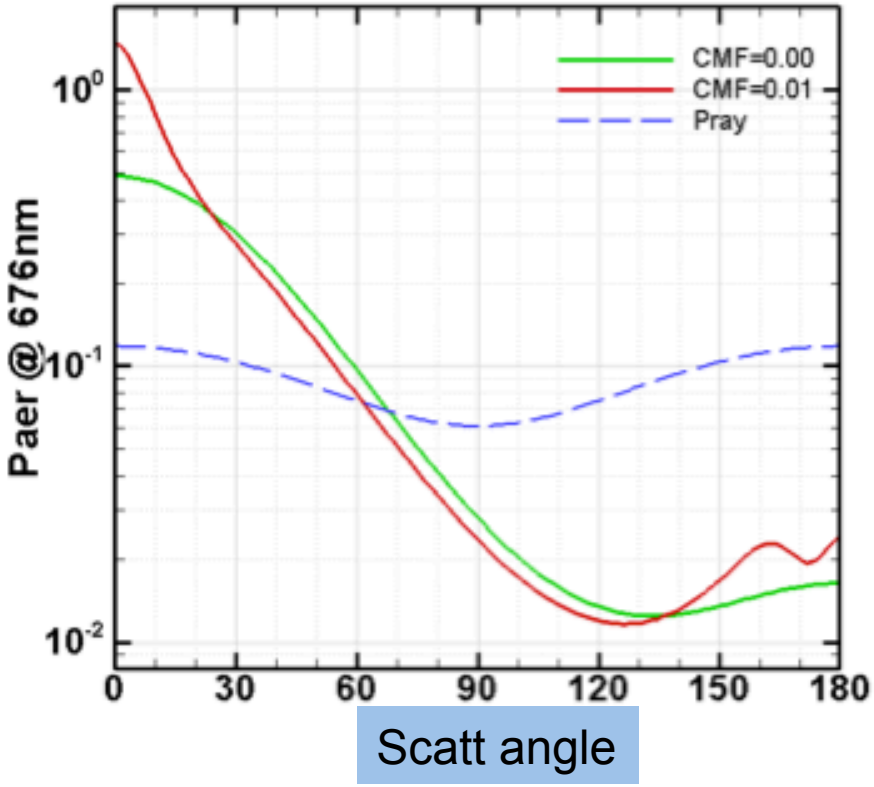


Effect of coarse mode fraction (CMF) in bimodal lognormal size distribution on AE

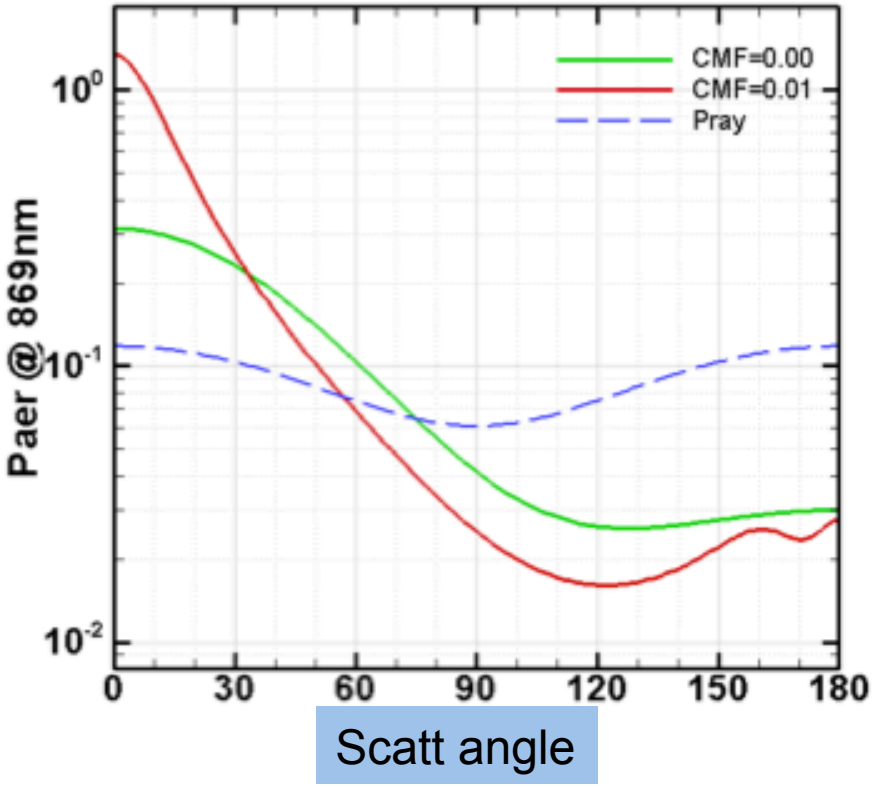


Effect of CMF on aerosol scattering phase function

676 nm



869 nm



V1.0 algorithm will use fixed CMF of 0.003. 869 nm may provide some CMF information, but it will be hard to validate it without SAGE III data.

V2.5 Ozone algorithm

- Use V1.0 aerosol profiles and the assumed size distribution model to correct for aerosol effect.
- Change UV normalization altitude to ~55 km
  - Shortest wavelength changed to 305 nm, top O_3 altitude will change to ~52 km
  - Goal is to improve 40-50 km O_3 by reducing PMC , stray light and cloud-caused errors.
  - Validation of mesospheric ozone is difficult due to diurnal effects and errors in MERRA data.
- Reduce the number of wavelengths used
  - 3-4 wavelength pairs in UV, and 1-4 triplets in VIS.

Summary & Outlook

- V1.0 Aerosol algorithm
  - Will provide extinctions @675 nm plus AE to convert to other wavelengths, and information to convert to number density and mixing ratio
  - Data released by June 30
- V2.5 ozone algorithm
  - Better aerosol correction, top altitude reduced to ~52 km
- Other Activities
  - Use MERRA data (with MLS+ OMI) and V1 aerosol profiles to validate OMPS LP radiances.
  - 2D SS RTM has been developed. It too can be tested using MERRA data.